What is claimed is:

1.   A method for generating CT images of a periodically moving examination area, comprising:

moving at least one focus, in order to scan a periodically movable object to be examined with a beam of rays coming from the at least one focus and with a two-dimensionally designed detector array with a multiplicity of distributed detector elements for detecting the rays of the beam of rays, relative to the object to be examined on at least one focal track circumscribing the object to be examined with the detector array lying opposite, wherein the detector elements of the detector array are adapted to deliver output data representing an attenuation of the rays when passed through the periodically movable object;;

simultaneously collecting movement data upon movement of the movable object, to enable assigning of detector data and data resulting therefrom to movement states;

filtering the output data;

three-dimensionally back-projecting the filtered output data to generate at least one sectional image of a layer of the object to be examined having a layer thickness, wherein each sectional image represents absorption values, obtained from the output data, of the voxel belonging to the layer of the object to be examined for the radiation of the beam of rays, wherein a weighting function, for weighting the spatial distance of a ray in question from the voxel in question, is used for the back-projecting, and wherein a weighting function, representing a time difference from the examination area movement state to be represented is also used for the back-projecting.

2.   The method as claimed in claim 1, wherein the filtering is carried out in the direction of a tangent to the focal track belonging to the respective focal position.

3.   The method as claimed in claim 1, wherein a conversion of the output data, obtained in the form of rays $P(\alpha,\beta,q)$ in a fan-ray geometry into parallel data available in the form of at least one of rays $P(\theta,\beta,q)$ and $P(\theta,p,q)$ in a parallel-ray geometry, is carried out before the filtering, wherein

α is the focal angle,

β is the fan angle,

q is the row index of the detector system corresponding to the z coordinate,

$\theta = \alpha + \beta$ is the parallel fan angle,

$p = R_F \sin(\beta)$ is the parallel coordinate corresponding to the ray distance from the rotation axis (system axis), and

R_F is the radius of the focal track.

4.   The method as claimed in claim 3, wherein the back-projecting of the parallel data is carried out in such a way that the sum

$$P_{x,y,z}(\theta) = \sum_k \sum_q h_z\left(d_{x,y,z}\left(\theta + k\pi, \left\{\frac{\tilde{p}}{\tilde{\beta}}\right\}, q\right)\right) \cdot h_{phase}(t(\theta + k\pi) - c_R(k)) \cdot P\left(\theta + k\pi, \left\{\frac{\tilde{p}}{\tilde{\beta}}\right\}, q\right)$$

is formed in the course of the back-projecting for each voxel (x, y, z) for each $\theta \in [0, \pi[$

for the rays $P(\theta + k\pi, \tilde{\beta}, q)$ or $P(\theta + k\pi, \tilde{p}, q)$ whose projection along the system axis passes through (x, y), wherein

x, y, z are the coordinates of the respective voxel,

k is an integer corresponding to the number of half-circuits of the focus which are involved in the reconstruction,

$\tilde{p}$ are the parallel coordinates of those rays whose projections along the system axis pass through the coordinates (x, y) of the respective voxel (x, y, z),

$\tilde{\beta}$ are the fan angles of those rays whose projections along the system axis pass through the coordinates (x, y) of the respective voxel (x, y, z),

h_z is a weighting function determining the layer thickness of the layer of the object to be examined which is represented in the sectional image being produced,

d is a function which is equal to the distance of the respective ray from the corresponding voxel (x, y, z) or depends on the distance of the respective ray from the corresponding voxel (x, y, z), and

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h_{phase} is a weighting function relating to the time difference of the

projection $P(\theta + k\pi, \tilde{\beta}, q)$ or $P(\theta + k\pi, \tilde{p}, q)$ from a movement state,

$c_R(k)$ representing a time position which determines the periodic

movement state of an examination area, preferably an assigned heart

cycle.

5. The method as claimed in claim 4, wherein the sum

$$P_{x,y,z}(\theta) = \frac{1}{H} \sum_k \sum_q h_z \left(d_{x,y,z} \left(\theta + k\pi, \left\{ \begin{matrix} \tilde{p} \\ \tilde{\beta} \end{matrix} \right\}, q \right) \right) \cdot h_{phase}(t(\theta + k\pi) - c_R(k)) \cdot P \left(\theta + k\pi, \left\{ \begin{matrix} \tilde{p} \\ \tilde{\beta} \end{matrix} \right\}, q \right)$$

which is normalized to the sum H of the weights h

$$H = \sum_k \sum_q h_z \left(d_{x,y,z} \left(\theta + k\pi, \left\{ \begin{matrix} \tilde{p} \\ \tilde{\beta} \end{matrix} \right\}, q \right) \right) \cdot h_{phase}(t(\theta + k\pi) - c_R(k))$$

is formed during the back-projection of the parallel data.

6. The method as claimed in claim 1, wherein the rays of each voxel in question are weighted during the back-projecting in such a way that rays striking the detector elements centrally are weighted relatively more heavily than rays striking at the edge.

7. The method as claimed in claim 1, wherein the focal track is a circular track.

8. The method as claimed in claim 1, wherein the focal track is a spiral track, obtained by moving the focus on the circular track about the system axis and simultaneously carrying out a relative movement between the focus and the object to be examined in the direction of the system axis.

9. The method as claimed in claim 1, wherein the detector elements are arranged distributed in rows and columns on the detector array.

10. A CT device for scanning a periodically movable object to be examined, with a beam of rays coming from at least one focus and with a two-dimensionally designed detector array with a multiplicity of distributed detector elements for detecting the rays

of the beam of rays, the at least one focus being moved relative to the object to be examined on at least one focal track circumscribing the object to be examined with the detector array lying opposite, the CT device including means for detection of the movement state of the object to be examined, for collection of the detector data, for filtering and back-projection as claimed in claim 1.

11. The CT device as claimed in claim 10, wherein each of said means are implemented at least partially by at least one of programs and program modules.

12. The method of claim 1, wherein the method is for generating CT images of a heart region of a living being.

13. The method of claim 1, wherein the method is for generating CT images of a heart region of a patient.

14. The method as claimed in claim 2, wherein a conversion of the output data, obtained in the form of rays $P(\alpha,\beta,q)$ in a fan-ray geometry into parallel data available in the form of at least one of rays $P(\theta,\beta,q)$ and $P(\theta,p,q)$ in a parallel-ray geometry, is carried out before the filtering, wherein

α is the focal angle,

β is the fan angle,

q is the row index of the detector system corresponding to the z coordinate,

$\theta = \alpha + \beta$ is the parallel fan angle,

$p = R_F \sin(\beta)$ is the parallel coordinate corresponding to the ray distance from the rotation axis (system axis), and

R_F is the radius of the focal track.

15. The method as claimed in claim 14, wherein the back-projecting of the parallel data is carried out in such a way that the sum

$$P_{x,y,z}(\theta) = \sum_k \sum_q h_z\left(d_{x,y,z}\left(\theta + k\pi, \left\{\begin{matrix}\tilde{p}\\\tilde{\beta}\end{matrix}\right\}, q\right)\right) \cdot h_{phase}(t(\theta + k\pi) - c_R(k)) \cdot P\left(\theta + k\pi, \left\{\begin{matrix}\tilde{p}\\\tilde{\beta}\end{matrix}\right\}, q\right)$$

is formed in the course of the back-projecting for each voxel (x, y, z) for each $\theta \in [0, \pi[$

for the rays $P(\theta + k\pi, \tilde{\beta}, q)$ or $P(\theta + k\pi, \tilde{p}, q)$ whose projection along the system axis

passes through (x, y), wherein

x, y, z	are the coordinates of the respective voxel,
k	is an integer corresponding to the number of half-circuits of the focus which are involved in the reconstruction,
$\tilde{p}$	are the parallel coordinates of those rays whose projections along the system axis pass through the coordinates (x, y) of the respective voxel (x, y, z),
$\tilde{\beta}$	are the fan angles of those rays whose projections along the system axis pass through the coordinates (x, y) of the respective voxel (x, y, z),
h_z	is a weighting function determining the layer thickness of the layer of the object to be examined which is represented in the sectional image being produced,
d	is a function which is equal to the distance of the respective ray from the corresponding voxel (x, y, z) or depends on the distance of the respective ray from the corresponding voxel (x, y, z), and
h_{phase}	is a weighting function relating to the time difference of the projection $P(\theta + k\pi, \tilde{\beta}, q)$ or $P(\theta + k\pi, \tilde{p}, q)$ from a movement state,
$c_R(k)$	representing a time position which determines the periodic movement state of an examination area, preferably an assigned heart cycle.

16.   The method as claimed in claim 15, wherein the sum

$$P_{x,y,z}(\theta) = \frac{1}{H}\sum_k \sum_q h_z\left(d_{x,y,z}\left(\theta + k\pi, \left\{\begin{matrix}\tilde{p}\\\tilde{\beta}\end{matrix}\right\}, q\right)\right) \cdot h_{phase}(t(\theta + k\pi) - c_R(k)) \cdot P\left(\theta + k\pi, \left\{\begin{matrix}\tilde{p}\\\tilde{\beta}\end{matrix}\right\}, q\right)$$

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which is normalized to the sum H of the weights h

$$H = \sum_k \sum_q h_z \left(d_{x,y,z} \left(\theta + k\pi, \left\{ \begin{matrix} \tilde{p} \\ \tilde{\beta} \end{matrix} \right\}, q \right) \right) \cdot h_{phase}(t(\theta + k\pi) - c_R(k))$$

is formed during the back-projection of the parallel data.

17.   The method as claimed in claim 2, wherein the focal track is a circular track.

18.   The method as claimed in claim 2, wherein the focal track is a spiral track, obtained by moving the focus on the circular track about the system axis and simultaneously carrying out a relative movement between the focus and the object to be examined in the direction of the system axis.

19.   The method as claimed in claim 5, wherein the focal track is a circular track.

20.   The method as claimed in claim 5, wherein the focal track is a spiral track, obtained by moving the focus on the circular track about the system axis and simultaneously carrying out a relative movement between the focus and the object to be examined in the direction of the system axis.

21.   The CT device of claim 10, wherein the CT device is for generating CT images of a heart region of a living being.

22.   The CT device of claim 10, wherein the CT device is for generating CT images of a heart region of a patient.

23.   A method for generating CT images, comprising:

scanning a periodically movable object to be examined with a beam of rays coming from at least one focus;

detecting the rays using a two-dimensionally designed detector array with a multiplicity of distributed detector elements, wherein the detector elements of the detector array are adapted to deliver output data representing an attenuation of the rays when passed through the periodically movable object;

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simultaneously collecting movement data upon movement of the movable object, to enable assigning of detector data and data resulting therefrom to movement states;

filtering the output data;

three-dimensionally back-projecting the filtered output data to generate at least one sectional image of a layer of the movable object having a layer thickness, wherein each sectional image represents absorption values, obtained from the output data, of a voxel belonging to the layer of the movable object for the radiation of the beam of rays, wherein a weighting function, for weighting a spatial distance of a ray in question from a voxel in question, is used for the back-projecting, and wherein a weighting function, representing a time difference from an examination area movement state to be represented is also used for the back-projecting.

24.   The method as claimed in claim 23, wherein the filtering is carried out in the direction of a tangent to the focal track belonging to the respective focal position.